

IN THE CLAIMS

Claims 1-22 (cancelled)

Claims 23 (currently amended): A method of estimating a usable battery capacity for a mobile device, comprising:

- ~~measuring~~ ~~determining~~ one or more operating condition of the mobile device;
- ~~measuring~~ ~~determining~~ a present loaded battery voltage of the mobile device;
- determining a present unloaded battery voltage based on the present loaded battery voltage and the one or more operating condition, wherein the present unloaded battery voltage represents a battery voltage in a completely unloaded condition;
- determining a present battery capacity using the present unloaded battery voltage;
- determining a loaded operational threshold voltage of the mobile device, the loaded operational threshold voltage being a battery voltage below which an operation of the mobile device is shut off, and at least one operation of the mobile device remains operable;
- determining an unloaded operational threshold voltage of the mobile device based on the loaded operational threshold voltage and the one or more operating condition;
- determining an operational threshold capacity using the unloaded operational threshold voltage;
- estimating the usable battery capacity based on the present battery capacity and the operational threshold capacity; and
- storing the usable battery capacity estimation in a computer-readable medium;
- wherein the usable battery capacity is estimated as a function of time.

Claim 24 (previously presented): The method of claim 23, wherein the usable battery capacity is an accessible capacity, and wherein the loaded operational threshold voltage is a battery voltage below which a radio in the mobile device is shut off, and at least one operation of the mobile device remains operable.

Claim 25 (cancelled)

Claim 26 (previously presented): The method of claim 23, wherein the mobile device includes a profile table that relates a plurality of battery profile values with the one or more operating condition of the mobile device, and wherein the profile table is used to determine the present unloaded battery voltage, the present battery capacity, the unloaded operational threshold voltage and the operational threshold capacity.

Claim 27 (previously presented): The method of claim 23, wherein the mobile device generates a warning message if the usable battery capacity falls below a warning threshold.

Claim 28 (previously presented): The method of claim 27, wherein the warning threshold is determined as a function of a predetermined warning time period and a battery current.

Claim 29 (previously presented): The method of claim 28, wherein the predetermined warning time period is an amount of time before the unloaded operational threshold voltage is reached that the warning message is to be generated.

Claim 30 (previously presented): The method of claim 29, wherein the warning message is generated when a difference between the present battery capacity and the operational threshold capacity becomes less than a multiple of the battery current and the predetermined warning time period.

Claim 31 (previously presented): The method of claim 23, wherein the one or more operating condition includes a battery temperature.

Claim 32 (previously presented): The method of claim 23, wherein the one or more operating condition includes a battery current.

Claim 33 (previously presented): The method of claim 23 wherein the one or more operating condition includes a transmit power of the mobile device.

Claim 34 (previously presented): The method of claim 26, further comprising:

- accessing the profile table to translate the one or more operating condition into a battery profile value;

- adjusting the battery profile value by a correction factor to generate a corrected battery profile value; and

- using the corrected battery profile value to determine the present battery capacity and the operational threshold capacity.

Claim 35 (previously presented): The method of claim 34, wherein the battery profile value is an equivalent series resistance (ESR) of the battery.

Claim 36 (previously presented): The method of claim 23, further comprising:

- estimating a remaining operating time based on the usable battery capacity.

Claim 37 (previously presented): A method of estimating the capacity of a battery to power a predetermined feature of a battery operated device, the predetermined feature operable when the battery is above a corresponding shut off voltage, the method comprising:

- measuring a battery voltage;

- determining an unloaded battery voltage by translating the measured battery voltage to take into account a load on the battery, wherein the unloaded battery voltage represents a battery voltage in a completely unloaded condition;

- determining at least one unloaded shut off voltage by translating the shut off voltage to take into account the load on the battery;

- determining a battery capacity using the unloaded battery voltage;

- determining a shut off capacity using the unloaded shut off voltage;

- estimating an estimated capacity for the predetermined feature as a difference between the shut off capacity and the battery capacity, wherein the predetermined feature will shut off if the battery falls below the shut off capacity, and wherein at least one feature of the battery operated device will remain operational if the battery falls below the shut off capacity; and

- storing the estimated capacity in a computer-readable medium;

- wherein the estimated capacity is estimated as a function of time.

Claim 38 (previously presented): The method of claim 37, wherein the predetermined feature includes a radio on the battery operated device, the radio having a corresponding radio shut off voltage.

Claim 39 (cancelled)

Claim 40 (previously presented): The method of claim 37, further comprising:
determining a battery current delivered by the battery;
determining a predetermined threshold capacity corresponding to a battery capacity required to continue to deliver the battery current for a predetermined amount of time; and
comparing the estimated capacity to the predetermined threshold capacity.

Claim 41 (previously presented): The method of claim 40, further comprising:
identifying when the estimated capacity is less than the predetermined threshold capacity;
and
in response to identifying that the estimated capacity is less than the predetermined threshold capacity, triggering a predetermined action on the battery operated device.

Claim 42 (previously presented) The method of claim 41, wherein the predetermined action is a warning action.

Claim 43 (previously presented): The method of claim 42, wherein the warning action is a battery low warning.

Claim 44 (previously presented): The method of claim 41, wherein the predetermined action is displaying the estimated capacity, the estimated capacity being displayed in terms of the predetermined amount of time after which the predetermined feature will be shut off.

Claim 45 (previously presented): The method of claim 40, further comprising:
issuing a warning to a user of the battery operated device indicating that the predetermined feature will be shut off at a time which is substantially coincidental with the predetermined amount of time after the warning.

Claim 46 (previously presented): The method of claim 40, wherein the step of determining a battery current delivered by the battery occurs at the time of the estimating step.

Claim 47 (previously presented): The method of claim 37, wherein the step of determining an unloaded battery voltage by translating the measured battery voltage to take into account the load on the battery includes the step of determining at least one operating condition for the battery operated device selected from the group consisting of: determining an effective serial resistance for the battery, determining a temperature of the battery operated device, applying a correction parameter, determining the transmit power, and determining an idle state.

Claim 48 (previously presented): A mobile device, comprising:

- a battery configured to power the mobile device;

- one or more sensor circuits configured to measure one or more operating conditions of the battery;

- a battery voltage measurement circuit configured to measure a present loaded battery voltage of the battery;

- a battery capacity estimation program configured to (1) determine a present unloaded battery voltage based on the present loaded battery voltage and the one or more operating conditions of the battery, wherein the present unloaded battery voltage represents a battery voltage in a completely unloaded condition, and (2) determine a present battery capacity using the present unloaded battery voltage;

- the battery capacity estimation program being further configured to (1) determine a loaded operational threshold voltage of the mobile device, the loaded operational threshold voltage being a battery voltage below which an operation of the mobile device is shut off, but at least one operation of the mobile device remains operational; (2) determine an unloaded operational threshold voltage of the mobile device based on the loaded operational threshold voltage and the one or more operating parameters, and (3) determine an operational threshold capacity using the unloaded operational threshold voltage; and

- the battery capacity estimation program being further configured to estimate a usable battery capacity based on the present battery capacity and the operational threshold capacity;

- wherein the usable battery capacity is estimated as a function of time.

Claim 49 (previously presented): The mobile device of claim 48, further comprising:

a profile table stored in one or more memory location on the mobile device and accessible by the battery capacity estimation program, the profile table relating a plurality of battery profile values with the one or more operating conditions of the mobile device;

wherein the battery capacity estimation program is configured to use the profile table to determine the present unloaded battery voltage, the present battery capacity, the unloaded operational threshold voltage and the operational threshold capacity.

Claim 50 (previously presented): The mobile device of claim 48, further comprising:

a radio configured to communicate via a wireless network;

wherein the loaded operational threshold voltage is a battery voltage below which the radio in the mobile device is shut off, but at least one operation of the mobile device remains operational.

Claim 51 (cancelled)

Claim 52 (previously presented): The mobile device of claim 48, wherein the mobile device is configured to generate a warning message if the usable battery capacity falls below a warning threshold.

Claim 53 (previously presented): The mobile device of claim 52, wherein the warning threshold is determined as a function of a predetermined warning time period and a battery current.

Claim 54 (previously presented): The mobile device of claim 48, wherein the one or more operating conditions includes a battery temperature.

Claim 55 (previously presented): The mobile device of claim 48, wherein the one or more operating conditions includes a battery current.

Claim 56 (previously presented): The mobile device of claim 48, wherein the one or more operating conditions includes a transmit power of the mobile device.

Claim 57 (previously presented): The method of claim 23, wherein the usable battery capacity is in units of current multiplied by time.

Claim 58 (previously presented): The method of claim 37, wherein the estimated capacity is in units of current multiplied by time.

Claim 59 (previously presented): The mobile device of claim 48, wherein the usable battery capacity is in units of current multiplied by time.